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# Low-Cost Method to Monitor Patient Adherence to HIV Antiretroviral Therapy Using Multiplex Cathepsin Zymography.

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## Abstract

Monitoring patient adherence to HIV antiretroviral therapy (ART) by patient survey is inherently error prone, justifying a need for objective, biological measures affordable in low-resource settings where HIV/AIDS epidemic is highest. In preliminary studies conducted in Ethiopia and South Africa, we observed loss of cysteine cathepsin activity in peripheral blood mononuclear cells of HIV-positive patients on ART. We optimized a rapid protocol for multiplex cathepsin zymography to quantify cysteine cathepsins, and prospectively enrolled 350 HIV-positive, ART-naïve adults attending the Themba Lethu Clinic, Johannesburg, South Africa, to test if suppressed cathepsin activity could be a biomarker of ART adherence (103 patients were included in final analysis). Poor adherence was defined as detectable viral load (>400 copies/ml) or simplified medication adherence questionnaire, 4-6 months after ART initiation. 86 % of patients with undetectable viral loads after 6 months were cathepsin negative, and cathepsin-positive patients were twice as likely to have detectable viral loads (RR 2.32 95 % CI 1.26-4.29). Together, this demonstrates proof of concept that multiplex cathepsin zymography may be an inexpensive, objective method to monitor patient adherence to ART. Low cost of this electrophoresis-based assay makes it a prime candidate for implementation in resource-limited settings.

**KEYWORDS:** AIDS; Cysteine protease; Infectious disease; Monitoring; Sub-Saharan Africa; Zymography

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